

C L A I M S

What is claimed and desired to be secured by Letters Patent is as follows:

1. A tool set for implanting a spinal rod in a patient; said tool set comprising:
 - a) a pair of end guide tools;
 - b) each of said end guide tool being adapted to attach at a lower end thereof to a respective spinal implant bone screw; and
 - c) each of said end guide tools including a longitudinal guide channel extending upwardly from said lower end thereof; each of said channels being sized and shaped to be adapted to receive opposite ends of the rod for operably guiding the rod ends toward respective bone screws.
2. The tool set according to Claim 1 wherein said tool set further includes:
 - a) at least one intermediate guide tool;
 - b) each of said intermediate guide tools including attachment structure adapted for attachment to a respective bone screw; and

- c) each of said intermediate guide tools including a longitudinal pass through slot extending from a bottom thereof upward and being adapted to receive therethrough and guide the rod to a bone screw attached to a respective intermediate guide tool.

3. The tool set according to Claim 1 wherein:

- a) said longitudinal guide channel is part of an open pathway that extends from near a bottom of a respective end guide tool to a top thereof; said pathway opening radially outward along the entire length thereof.

4. The tool set according to Claim 3 wherein:

- a) each said end guide tool has a cutout region between said longitudinal guide channel and said guide tool lower end; said cutout being open in the rear so as to define a pass through slot sized and shaped to be adapted to allow passage therethrough of one end of the rod after the rod has been guided to near a bone screw by said channel.

5. The tool set according to Claim 1 wherein:
 - a) each of said end guide tools has a lower attachment structure adapted to removably attach to a bone screw; and
 - b) each of said end guide tool attachment structures including a curved hook member that is sized and shaped to be adapted to be received in a receiver on a bone screw when said hook member is aligned with the receiver and rotated axially.
6. The tool set according to Claim 2 wherein:
 - a) each of said intermediate tool guide slots extends to an intermediate location along the respective intermediate guide tool and at the top thereof opens into a radially outward opening upper channel with said upper channel extending to the top of said intermediate guide tool.
7. The tool set according to Claim 1 wherein:
 - a) each end guide tool includes a lower end recess along said channel that is sized and shaped to abut against and bridge a portion of the rod during removal of said end guide tool from a respective bone screw, so that said end guide tool

can be rotated relative to a bone screw from an attachment configuration to a removal configuration with said recess being received around the rod; said recess having a curvature that is sized and shaped to be substantially the same as the rod.

8. A vertebral support rod implantation kit adapted for use with a plurality of vertebra including:
 - a) a plurality of poly axial bone screws with each bone screw being adapted for implantation in one vertebra; each of said bone screws having a mating attachment structure;
 - b) an elongate rod sized and shaped to extend between a pair of end bone screws of said plurality of bone screws;
 - c) a pair of end guide tools;
 - d) each of said end guide tools including an end guide tool attachment structure at a lower end thereof that operably and removably connects with said bone screw mating attachment structure of a respective bone screw; and
 - e) each of said end guide tools including a longitudinal guide channel extending upwardly from near said lower end thereof; each of said channels

being sized and shaped to slidably receive opposite ends of the rod for operably guiding the rod ends toward respective bone screws.

9. The kit according to Claim 8 wherein said tool set further includes:

- a) at least one intermediate guide tool:
- b) each of said intermediate guide tools including intermediate guide tool attachment structure that operably and removably connects with said mating attachment structure of a respective bone screw; and
- c) each of said intermediate guide tools including a longitudinal pass through slot extending from the bottom thereof upward and operably receiving therethrough and guiding intermediate locations along the rod to a respective bone screw attached to the intermediate guide tool.

10. The kit according to Claim 9 wherein:

- a) said longitudinal guide channel extends from near a bottom of a respective end guide tool to a top thereof providing an open pathway from a top to the bottom of a respective end guide tool.

11. The kit set according to Claim 10 wherein:
- a) each of said guide tools has a cutout region between said longitudinal guide channel and said guide tool lower end; said cutout providing a pass through slot sized and shaped to receive one end of the rod after the rod has been guided to near a respective bone screw by said channel.
12. The kit according to Claim 8 wherein:
- a) each of said end guide tools has a lower attachment structure;
 - b) each bone screw includes a mating attachment structure; said mating attachment structure including a circumferentially extending slot and an upper recess accessible from said slot; and
 - c) said end guide tool attachment structure including a curved hook member that is sized and shaped to operably be received in said recess on a respective bone screw when said hook member is aligned with said recess and rotated axially.

13. The kit according to Claim 9 wherein:

- a) each of said intermediate tool guide slots extends to an intermediate location along the respective intermediate guide tool and at the top thereof directly opens into a radially outward opening upper channel with said upper channel extending to the top of said intermediate guide tool.

14. The kit according to Claim 8 wherein:

- a) each end guide tool includes a lower end recess on said channel that is sized and shaped to abut against and bridge a portion of the rod during removal of said end guide tool from a respective bone screw, so that said end guide tool can be rotated ninety degrees relative to a bone screw from an attachment configuration to a removal configuration with said recess being received around the rod; said recess being sized and shaped to have a curvature that is substantially the same as said rod.

15. A bone screw and rod seating assembly comprising:
- a) a bone screw having a shank for implanting in a bone and a head with a channel adapted to receive a rod;
 - b) said bone screw head including a first attachment structure thereon;
 - c) an elongate guide tool having a radially outward facing channel extending parallel to an axis thereof and upwardly from near a bottom of said guide tool; said channel sized and shaped to receive a first end of a rod and operably guide said rod first end to said bone screw head; said guide tool being sized to partially extend above a patient's skin so as to allow percutaneous manipulation of said guide tool by a surgeon; and
 - d) said guide tool bottom including a second attachment structure thereon; said first and second attachment structures being mateable to releaseably secure said guide tool to said bone screw head.

16. A bone screw and rod seating assembly comprising:
- a) a bone screw having a shank for implanting in a bone and a head with channel adapted to receive a rod;
 - b) said bone screw head including a first attachment structure thereon;
 - c) an elongate guide tool having a radially pass through slot extending upwardly from near a bottom thereof; said slot being sized and shaped to receive a rod therethrough and operably guide said rod to said bone screw head; said guide tool being sized to partially extend above a patient's skin so as to allow percutaneous manipulation of said guide tool by a surgeon; and
 - d) said guide tool bottom including a second attachment structure thereon; said first and second attachment structures being mateable to releaseably secure said guide tool to said bone screw head.

17. A method of percutaneously implanting a rod along a human spine by attaching the rod to individual vertebrae in a selected group of vertebrae comprising the steps of:
- a) forming an incision in a patient's skin generally above at least two of said selected vertebrae;
 - b) inserting a polyaxial bone screw through each incision and implanting the bone screw in a respective vertebra;
 - c) joining an end guide tool to each of a pair of end bone screws to be used in conjunction with a pair of vertebrae at opposite ends of said selected group of vertebrae wherein each of said end guide tools includes an elongate channel extending upward from near a bottom of a respective end guide tool that is sized and shaped to receive an end of said rod;
 - d) rotating said end guide tools such that said channels are facing each other;
 - e) inserting said rod through one of said incisions so that each of said rod ends engages a respective channel; and
 - f) urging said rod along said channels to a bottom of the end guide tools and into heads of respective bone screw.

18. The method according to Claim 17 including the steps of:
- a) providing an intermediate guide tool for each bone screw used with each vertebra of said selected group of said vertebrae between said end vertebrae wherein each said intermediate guide tool has an elongate slot extending upward from a bottom of the intermediate guide tool; and
 - b) inserting said rod through each of said slots when placing said rod in said channels such that said rod is guided by said slots to respective bone screws.
19. In a procedure for implanting a rod in a human spine by inserting bone screws into selected vertebrae and thereafter attaching the rod to the bone screws; said improvement comprising the steps of:
- a) providing an end guide tool for each bone screw at opposite ends of said selected vertebrae wherein each of said guide tools removably attaches to a respective bone screw and has an elongate channel that extends upward from near a bottom of the guide tool; said guide tool being sized and shaped to extend above the skin of the patient when the guide tool is attached to a respective bone screw

with the bone screw located in a respective vertebra;

- b) aligning the channels in facing relationship;
- c) placing opposite ends of said rod in respective channels; and
- d) urging said rod toward said bone screws utilizing said channels to guide the ends of said rod.

20. A method of percutaneously inserting a spinal rod into a pair of end bone screws comprising the steps of:

- a) providing a pair of end guide tools;
- b) inserting a said guide tool through a patient's skin and in communication with each respective end bone screw;
- c) inserting a rod and directing opposite ends of the rod to said channels; and
- d) guiding said rod ends in said channels to said bone screws.

21. A method of implanting a spinal rod in a patient comprising the steps of:
- a) making an incision in a patient;
 - b) installing a bone screw in a vertebra of a patient through said incision;
 - c) attaching a guide tool to said bone screw wherein said guide tool includes an elongate channel;
 - d) inserting one end of said rod in said channel and thereafter urging said rod toward said bone screw under guidance of said channel;
 - e) securing said rod to said bone screw; and
 - f) removing said guide.
22. The method according to Claim 21 including the steps of:
- a) attaching said guide tool to said bone screw before inserting said bone screw in said vertebra;
 - b) prior to inserting said rod, inserting a driver through said guide tool and using said driver to install said bone screw in said vertebra; and
 - c) thereafter removing said driver from said guide tool.

23. In a guide tool for implanting a spinal rod in a bone screw the improvement comprising:

- a) a lower elongate channel sized and shaped to be operably located beneath a patient's skin during use and adapted to guide a rod to a bone screw connected to said guide tool; and
- b) an outwardly open upper channel that is sized and shaped to side load so as to receive a closure top for the bone screw and being operably located above the patient's skin during use; said upper channel being connected with said lower channel so as to form a pass-through passageway to allow ~~the said~~ *closure top into said lower channel* ~~channel to a lower end~~ of said guide tool.

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